NOISE ELEMENT
CITY OF BELMONT
GENERAL PLAN

ADOPTED BY CITY COUNCIL
JULY 23, 1996

1 INTRODUCTION

Scope and Role of the Noise Element

The Noise Element must, by state planning law, contain an analysis and quantification of the noise levels throughout the community. The Noise Element must consider and evaluate noise sources and noise sensitive uses and the relationship between the two throughout the planning area. Political, economic, social and personal dispositions toward noise are infused into the planning process. Previous land use decisions, like the location and extent of public transportation modes such as CalTrain and SamTrans lines; the location of commercial and industrial activities; and the location and relationship of sensitive receptors, such as residential areas, hospitals, schools, open spaces, and libraries, play an important and complex role in the analysis.

Land use and transportation patterns in Belmont are well established. A choice does not exist to move major transportation corridors in order to reduce noise exposure. The task ahead, then, is to identify and quantify the source of noise in the community; and develop a goal, objectives and policies to reduce existing and minimize future noise impacts.

State Planning Law

State planning law requires every city and county to adopt a Noise Element. The Noise Element must accurately reflect the noise environment, stationary sources of noise and noise impacts on local residents. A Noise Element must contain a discussion of the methods to implement noise policies and standards that comply with state noise insulation standards. Section 65302 (f) of the Government Code states that a Noise Element addresses:

- identification and appraisal of major noise sources;
- existing and projected levels of noise and noise contours for major noise sources;
- determination of the extent of "noise problems" in the community; and,
- identification and implementation of ways to reduce noise in order to protect the residents from excess noise exposure.

Many of the methods used to typify the noise environment involve complex measuring and computer modeling techniques. Many factors, as will be discussed later, play in the selection of the future projected year for noise contour mapping. A Noise Element is a document which is used to guide land use decisions and, as is the case with all elements of a General Plan, it is used in conjunction with the other elements.

City-wide Noise Survey

Methodology

Environmental Science Associates (ESA) was retained by the City to conduct a City-wide noise survey which included five 24-hour noise measurements and eight short-term (15-minute) noise measurements. The City-wide noise survey documents ambient noise conditions in areas that can be characterized as "typical residential" as well as areas known or suspected to experience noise problems (e.g., near U.S. Route 101 or near the CalTrain tracks).

Summary of Findings

On the basis of a City-wide noise survey and a review of relevant environmental and planning documents, the following conclusions can be drawn:

- The vast majority of Belmont residents live in the hilly portion of the City west of El Camino Real, away from major roadways and other sources of noise, and experience an environment free of pervasive or intrusive noise.

- The highest average noise levels in Belmont are observed along the U.S. Route 101 corridor. However, noise impacts from U.S. 101 are lessened by land use development policies (that have resulted in less noise-sensitive uses east of U.S. 101) and a barrier on the west side of the highway. Relatively high noise impacts, however, occur along Oxford Way (south of the barrier) and along the off-ramp from southbound U.S. 101 to Ralston Avenue.

- Traffic on El Camino Real, Ralston Avenue, Old County Road, and Alameda de las Pulgas generate relatively high average noise levels for adjoining land uses. With the exception of El Camino Real, these roadways extend through, or border on, residential areas.

- Along portions of Old County Road north of Ralston Avenue, noise impacts from traffic combine with intrusive noise from commercial uses (mostly auto service and repair shops) and train passby events to create an ambient noise environment that is the occasional source of complaints from existing residents. While all three sources (traffic, train, commercial uses) contribute to overall ambient noise levels along Old County Road, the predominant source of noise is traffic followed by commercial uses and, lastly, by train noise.

- Aircraft operations associated with San Carlos Airport (primarily a general aviation airport) have little noise impact on the residents of the City of Belmont. General aviation operations are not expected to increase significantly in the Bay Area over the next 20 years.

SOURCE: Environmental Science Associates

Figure 1
Noise Measurement Locations

- CalTrain operations result in intrusive noise effects throughout the day within the El Camino Real corridor. Given that (mostly) less noise-sensitive land uses lie in the immediate vicinity of the tracks, the relatively high ambient noise levels due to traffic, and the low number of nighttime train passby events, CalTrain noise impacts on the residents of Belmont are minimal. In the future, noise impacts from CalTrain should be even less since the two grade separation projects in Belmont would reduce the need for train engineers to use their horns, the single most intrusive element of train operations.

- While most of the City is developed, several of the undeveloped parcels are located in areas, such as the area east of U.S. Route 101 and along Ralston Avenue, which experience relatively high noise levels. Future noise impacts have largely been avoided in the undeveloped area east of U.S. 101 by planning for less noise-sensitive land uses adjacent to the roadway. Along Ralston Avenue, topographical features may be used in project design to avoid noise impacts or the visual impacts associated with noise barriers.

Noise Sources and Levels

The ambient noise environment of the City of Belmont is influenced by a variety of noise sources, most of which are related to transportation. Differences in ambient noise levels from one neighborhood to another largely reflect differences in the amount of motor vehicle traffic activity in the vicinity. Table 1 contains a summary of a series of short-term measurements conducted at eight different locations throughout the City. The locations from which these measurements (Locations #1 through #8) were taken are illustrated in Figure 1. Table 2 contains a summary of the five 24-hour measurements that were taken as part of the City-wide noise survey. Figure 1 also illustrates where these measurements (Locations A through E) were taken.

TABLE 1: RESULTS OF SHORT-TERM NOISE MEASUREMENT SURVEY

Location /a/	Measurement Period Start /b/	Distance to centerline	Noise Levels (dBA) /c,d/			
			L_{eq}	L_{max}	L_{10}	L_{50}
1: Cipriani/ Monserat	4:20 p.m.	30 to 35 feet	70	87	73	62
2: Ala. de las Pulgas/Carlmont	4:55 p.m.	30 to 35 feet	72	88	74	69
3: Ala. de las Pulgas/Covington	5:25 p.m.	30 to 35 feet	71	85	75	67
4: Davey Glen/ Middle	4:30 p.m.	40 to 45 feet	64	82	66	57
5: El Camino/ Davey Glen	4:50 p.m.	90 to 100 feet	71	84	74	69
6: East of 101 /e/	4:25 p.m.	200 to 250 feet	63	70	64	62
7: Ralston/Kedith	5:00 p.m.	40 to 45 feet /f/	66	90	65	63
8: 5th/Broadway	5:35 p.m.	45 to 50 feet	66	94	60	53

/a/ Measurement locations are illustrated in Figure 1.

/b/ All short-term measurements were taken over 15-minute periods on October 2, 3, and 4, 1995.

/c/ All noise measurements were taken with a Metrosonics' noise meter (model dB-308) which was calibrated prior to use.

/d/ L_{max} = maximum noise level; L_{10} = noise exceeded 10 percent of the time; L_{50} = noise level exceeded 50 percent of the time.

/e/ Congested traffic conditions prevailed during the measurement period. Congested traffic conditions lead to slow vehicle speeds producing lower-than-expected noise levels.

/f/ Distance refers to the centerline of Ralston Avenue

SOURCE: Environmental Science Associates

TABLE 2: RESULT OF 24-HOUR NOISE MEASUREMENTS

Location /a/	Measurement Period Start	Distance to centerline	Noise Levels (dBA) /b,c/			
			L_{eq}	L_{10}	L_{dn}	L_{max}
A: Monserat Avenue	September 12, 1995; 6:00 p.m.	30 to 35 feet	61	64	56	82
B: Softball Field East of U.S. 101	August 15, 1995; 6:00 p.m.	700 feet to U.S. 101 median	70	72	71	90
C: Oxford Way	August 15, 1995; 6:00 p.m.	300 feet to U.S. 101 median	70	73	67	87
D: Ralston Avenue	October 5, 1995; 6:00 p.m.	70 feet	69	71	67	87
E: Old County Road	September 11, 1995; 2:00 p.m.	40 feet	69	71	68	96

/a/ Measurement locations are illustrated in Figure 1.

/b/ All noise measurements were taken with a Metrosonics' noise meter (model dB-308) which was calibrated prior to use.

/c/ L_{eq} = energy equivalent (or "average") noise level during p.m. peak hour; L_{10} = noise exceeded 10 percent of the time during the p.m. peak hour; L_{dn} = day-night weighted noise level; L_{max} = maximum noise level.

SOURCE: Environmental Science Associates

2 BACKGROUND INFORMATION

Introduction

The following two sections contain a definition of many of the terms used to describe noise and a discussion of noise concepts. The following terms and the concepts they are founded on are also used in other planning documents such as environmental impacts reports; acoustical studies; the building, construction and engineering trades; and the aeronautic and transportation fields, to describe noise.

Noise Terms

Noise Descriptors

A-Weighted Sound Level (dBA) is the sound level in decibels as measured on a sound meter using a filtering device that responds to sound similar to the way the human ear hears sound. There are other filtering devices used when measuring sound, which measure different components of the sound. Since other measuring devices exist, it is important to indicate which device is used; this is why the acronym dBA accompanies measurements taken with the A-filtering devices.

Community Noise Equivalent Level (CNEL) is the average equivalent A-filtered sound level during a 24-hour period. The value is obtained after the addition of five decibels to sound levels in the evening from 7:00 P.M. to 10:00 P.M. and after the addition of 10 decibels in the night after 10:00 P.M. and 7:00 A.M. The CNEL weights the actual noise measurements taken to account for the increased sensitivity people have to noise during the evening and nighttime hours.

Decibel is a unit of measurement used to describe the level of a given sound.

Energy Noise Equivalent Level (L_{eq}) is the sound level corresponding to a steady state sound level containing the same level over a given period of time. Sound levels vary over a period of time, more so than temperature over a 24-hour period. Remembering that the unit sound is measured in is logarithmic, the L_{eq} is the closest value to an average for a given period of time.

Level Day Night (L_{dn}) is an average noise level measurement, based on human reaction to cumulative noise exposure over a 24 hour period which factors in a 10 decibel weighting to noise levels between the hours of 10:00 P.M. and 7:00 A.M. In practical applications, the L_{dn} and CNEL noise metrics are the same. There is less than one decibel difference between an L_{dn} and CNEL with the CNEL being slightly higher than the L_{dn}.

L_{max} is the highest noise level recorded during the measurement period. The $L_{max,}$ represents one intrusive noise event, there may be other intrusive events of less intensity during the measurement period. Intrusive noise can typically be from such sources as a horn or siren or construction activities.

L_{10} represents the noise level that is exceeded 10 percent of the time during a given time period (i.e., a 50 dBA, L_{10} means that the noise environment exceeds 50 dBA more than 10 percent of the time within a referenced timeframe, 1, 8 or 24 hours). The current Noise Element for Belmont's General Plan employs the L_{10} noise metric. As a point of comparison, the L_{10} noise metric typically describes a given noise environment three dBA higher than the L_{eq} noise descripter.

Noise Reduction

Attenuation refers to the lessening or reduction of a noise level. Noise attenuates by traveling a distance from the source or by other mechanisms such as absorption or reflection. The placement of buildings, sound walls, and noise insulation features are predicated on noise attenuation. Noise attenuates at different rates depending if the noise source originates from a point or line source and if it travels over a hard or soft surface and if it is absorbed or reflected by a noise mitigation feature. Basically five things are taken into consideration when calculating noise attenuation: the type of noise; level of noise at the source; distance the noise travels to the point of interest; type of terrain over which the noise travels; and the presence or absence of noise barriers.

Line of Site is often used when describing the noise source and noise receiver relationship. Basically, if one can see the noise source then one can hear the noise; however, the line of sight is broken by a wall, buildings, mountain, or other barrier, then the noise source is reduced accordingly. Various features reduce noise at different levels and these differences are discussed throughout this Noise Element.

Miscellaneous Noise Terms

Ambient Noise Level constitutes the "normal" or "background" noise components and level of noise at a given location. Ambient noise is a composite from all noise sources that are experienced in a given location. Ambient noise in a residential area, for example, could consist of sounds of people talking, dogs barking, children playing and cars passing by. Ambient noise in an office might consist of people talking, telephones ringing, and the sound of typewriters or computer keyboards clicking.

Intrusive Noise is a noise that intrudes over the existing ambient noise in a given location. The relative intrusiveness of the sound depends upon the amplitude, duration, frequency and time of occurrence of the intrusive noise as well as the level of ambient noise. A train whistle is an example of an intrusive noise.

Noise Concepts

Background

Ambient sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are measured in decibels using a measuring device (dBA) which closely approximates the way the human ear responds to sound. The threshold of human hearing roughly corresponds to zero dBA while the threshold of pain is approximately 120 dBA; 120 dBA corresponds to a jet taking off at 200 feet from source (see Figure 2, A-Weighted Sound Levels). Decibels are calculated on the logarithmic scale; an increase of 10 decibels represents a ten-fold increase in sound level, however, the sound is perceived as twice as loud. For example, 65 dBA is perceived to be about twice as loud as 55 dBA. An increase of three dBA is just barely perceptible to the human ear; a five dBA increase is clearly noticeable; and a 10 dBA increase is heard as an approximate doubling in loudness.

The frequency of a sound refers to the number of pressure fluctuations per second in the sound; the unit of measure is the hertz (Hz.) or cycles per second (cps). Most sound is not comprised of a single frequency, but a broad band of frequencies. The characterization of sound level magnitude with respect to frequency is called the sound spectrum. The sound spectrum of the human ear is typically described in terms of octave bands which separate the audible frequency range into ten segments, from 20-20,000 Hz.

The human ear has a described sensitivity to low frequencies and extreme high frequencies. The A-weighted measuring device, referenced above, de-emphasizes the importance of frequency components below 1,000 Hz. and above 5,000 Hz. approximately the way the human ear responds to sound.

Although a single sound level value may adequately describe ambient noise at a given instance in time, community noise levels vary continuously. Ambient noise is a combination of distance noise sources which produce a relatively steady noise having no identifiable source. Distant sources change gradually throughout the day, and may include traffic, wind in trees, and land uses such as commercial activities. Superimposed on this slowly varying background is a succession of identifiable or intrusive noise events. Statistical descriptors were developed to describe the time-varying character of ambient noise. The Noise Equivalent Level (L_{eq}) is such a descriptor and its representative of an equivalent constant sound level of a given period of time. The actual noise level measured during a given period of time, say 24 hours, varies; a single noise event during the time period may have reached 90 dBA (the L_{max}) and the lowest may have been 35 dBA while the L_{eq} representing that time frame may be 55 dBA, L_{eq}. The 90 dBA level represents the most intrusive noise event during the measuring period and is referred to as the L_{max}. Intrusive noise events are of particular importance in understanding and assessing construction or transportation related noise impacts and in levying conditions of approval on project to limit construction activities to the less noise sensitive hours of the day.

Figure 2
A-Weighted Sound Levels

	140	
Civil Defense Siren (100')	130	Threshold of Pain
Jet Takeoff (200')	120	
Riveting Machine	110	Rock Music Band
Diesel Bus (15') BART Train Passby (10')	100	Piledriver (50') Ambulance Siren (100')
	90	Boiler Room
Pneumatic Drill (50')	80	Printing Press Plant Home Garage Disposal
Muni Light Rail Vehicle (35') Freight Cars (100')	70	Inside Sports Car 50 MPH
Vacuum Cleaner (10') Speech (1')	60	Data Processing Center Department Store
Vehicular Traffic Near Freeway	50	Private Business Office Light Traffic (100')
Large Transformer (200') Average Residence	40	Typical Minimum Nighttime Levels
	30	Residential Area
Soft Whisper (5')	20	
Rustling Leaves	10	Recording Studio
Threshold of Hearing	0	Mosquito (3')

(100') Distance in Feet Between Source and Listener

Noise Defined

Noise is generally defined as unwanted sound. Whether a sound is unwanted or not depends on when it occurs, what the listener is doing when it occurs, and the characteristics of the sound and how intrusive it is above background levels. Consider for example the characteristics of sound: the loudness or intensity; frequency; duration; repetition rate; time of occurrence; and its unfamiliarity or uniqueness. Overlay those characteristics with the characteristics of a listener or the situation: the ambient noise; an individual's particular sensitivity to noise; the activity of the listener; and the listener's perceived need or justification of the noise. The electronic beep of a person's wrist watch during a symphony or theater performance may indeed be an unwanted sound (noise). The person hearing the beep of the wrist watch every half hour during the performance may be distracted from enjoying the performance and may be very annoyed, perceiving the sound as an unnecessary intrusion. The same beep of a wrist watch during the day in an office may be inaudible, and if it were audible, it may be perceived as necessary, and therefore justified, as a method to track time while working on various projects. Noise descriptors such as L_{10}, Ldn and CNEL are based upon community values in assessing noise exposure and in evaluating and regulating what is considered acceptable exposure.

In sum, response to noise is somewhat subjective and is also dependent upon the level of the noise; the frequency composition of the sound; the variation of sound over time; as well as the disposition and activity of the listener.

Noise Travel and Attenuation

Noise originates from two basic sources, line and point sources. Line sources include such things as a stream of moving traffic, a moving train, conveyor belt, or a river. Noise from a line source produces parallel sound waves moving in a line outward from the source. Point source noise originates from a single source such as a horn, a motor and machinery. Point source noise produces waves which travel in a circular pattern, much similar to that of waves of water traveling from a stone dropped in a pond. The distinction between the two sources is important in terms of the rate of noise attenuation.

Noise attenuates by traveling a distance from the source and by other mechanisms such as absorption or reflection. A factor in determining the rate noise will attenuate is whether the noise travels over hard or soft terrain. Hard terrain includes asphalt, concrete, steel, and buildings such as low and high rises constructed of such materials. Hard surfaces tend to reflect noise and may indeed block noise from passing through which is the desired end result. A soft surface includes barren or landscaped earth and acoustically absorptive materials. Soft surfaces tend to absorb noise more than hard surfaces. Noise from a line source will attenuate approximately three dBA per doubling of distance from the source in hard terrain and approximately 4.5 dBA per doubling of distance in soft terrain. Point source noise will attenuate approximately six dBA per doubling of distance from the source in hard terrain and approximately nine dBA per doubling of distance in soft terrain.

Reflection also attenuates noise. Noise strikes a hard surface and is reflected back towards the source as opposed to passing through to a sensitive receptor, like a residential area. A noise wall along a freeway is an example of how reflection works to reduce noise. Noise from traffic strikes the wall and is reflected back to the freeway corridor. Noise along the freeway is increased however as less noise passes through to the noise sensitive area. As an example, buildings surrounding an open space on three sides with a roadway adjacent to the fourth side, would tend to reflect traffic and other noises in the area off the walls into the open space. Building placement and configuration as well as noise insulation features are all important components in noise analysis and noise prevention and mitigation programs. The row of commercial buildings abutting the CalTrain track serve as a noise wall to the residences across Old County Road.

A building envelope attenuates noise passing through to the interior of the building. Some portions of the building envelope will reflect noise, some portions will absorb noise and some noise will be transmitted through to the interior of the building. Typically a building of pre 1950 construction (without additional noise insulation features) and with partially open windows will attenuate outside noise by 10-15 dBA; post 1950 construction and windows closed will attenuate noise up to 25 dBA.

Noise Compatibility Guidelines, developed by the State Office of Noise Control, establish certain criteria for noise levels with regard to the type of land use proposed. Each category of land use enjoys a range of noise levels considered compatible with the use and the noise levels may increase provided certain noise insulation features are employed (see Figure 3, Noise Compatibility Guidelines). The guidelines are predicated on the fact that outdoor noise will attenuate to interior levels determined to be healthy and are designed to provide useable outdoor open space that is reasonably quiet. Belmont adopted the Noise Compatibility Guidelines in 1976 using the L_{10} noise metric. The current (1996) noise element uses the L_{dn} metric which is a more standard metric. The Noise Guidelines are applied to new development but can and do serve as a guide to assess impacts in existing conditions.

The Environmental Protection Agency (EPA) has established 70 dBA, L_{eq} as the noise level requisite to protect the population from significant hearing damage, with a margin of safety, from environmental noise. The levels assumes a 365-day per year continual exposure. An L_{eq} value is approximately three decibels lower than a calculated L_{dn} value.

Noise Sources and Sensitive Receptors

The major contributor to the noise environment in Belmont is traffic. Other aspects of suburban life such as heavy commercial activities along Old County Road also contribute to the noise environment. During the day, the heavy commercial activities add incrementally to the noise environment in the area. In the evening when the businesses cease to operate, the structures themselves serve as a sound wall for the more sensitive (residential) land uses across Old County Road sheltering them from State Route 82 traffic and CalTrain noise.

Residential units, schools, hospitals, extended care facilities and open spaces are land uses considered more sensitive to high noise levels or changes in ambient noise than commercial or industrial land uses. Noise sensitive land uses, or sensitive receptors as they are often termed, are considered sensitive because people are usually resting, relaxing, convalescing, learning or enjoying recreation activities and excessive noise can impinge on these activities. Conversely, land uses that are less sensitive to excessive noise levels or changes in the ambient noise environment include industrial, commercial, and transportation related uses. The noise sensitive land uses in Belmont are relatively free of intrusive and persuasive noise, as discussed in the summary section.

Effects of Noise on People

Hearing loss and human stress reactions are common effects that noise has on people. Noise can also interfere with activities such as speech, sleeping and learning. The EPA has established noise thresholds that, if exceeded, are hazardous to human health.

The EPA has determined that 70 dBA, L_{eq} is the level of environmental noise, at a 365 day a year exposure, which will protect the population from hearing loss. Please note that 70 dBA, L_{eq} is not a time weighted value but represents an actual fairly continuous noise state. The EPA has identified 75 dBA, L_{eq} as the eight-hour work exposure threshold necessary to protect from hearing loss. The sound of human speech is typically 60 to 65 dBA; noise begins to interfere with a listener's hearing when it exceeds 55 dBA; at 50 dBA sentence intelligibility is unaffected. Continuous noise in excess of 55 dBA inside a classroom can interfere with the hearing, concentration and learning of the students. Continuous noise in exceed of 65 dBA will interfere with sentence intelligibility 20 percent of the time and continuous noise in excess of 75 dBA will affect sentence intelligibility.

The EPA has not established threshold exposure criteria for the non-auditory effects of noise. The EPA has stated that the noise levels established to protect against hearing loss should be sufficient to protect the non-auditory effects of noise. Non-auditory effects of noise include physiological responses such as stress related conditions; high blood pressure, coronary disease, migraine headaches, fatigue, insomnia, hyper- and hypotension, and digestive disorders.

Relationship to Other Jurisdictions and Documents

The following section identifies other policy making jurisdictions and documents that influence the effectiveness and implementation of the Noise Element. In most cases, Belmont has no direct control over the agencies mentioned, but does however, work in a cooperative manner with the agencies. Often the most expeditious method to affect the noise environment in Belmont in a positive fashion is to continue to be aware of the actions of the following jurisdictions and to comment on or participate in the preparation of plans and actions via the review of published

draft environmental impact reports or plans developed by air and ground related transportation agencies.

Federal

Federal Aviation Administration (FAA)

The FAA administers a wide range of airport related programs. Air traffic control; safety inspections; noise abatement programs; and inspection of aircraft and security equipment are just a few of the programs and services the FAA administers. The FAA, through enabling legislation (Federal Aviation Regulations, Part 150), administers federal monies for noise abatement and mitigation. Noise mitigation programs include the insulation of homes that are within a particular noise contour (65 dBA, CNEL) originating from an airport. The local FAA office is in Burlingame. Belmont does not experience significant noise from San Francisco International Airport (less than 55 dBA, CNEL) or San Carlos Airport (60 dBA, CNEL).

State

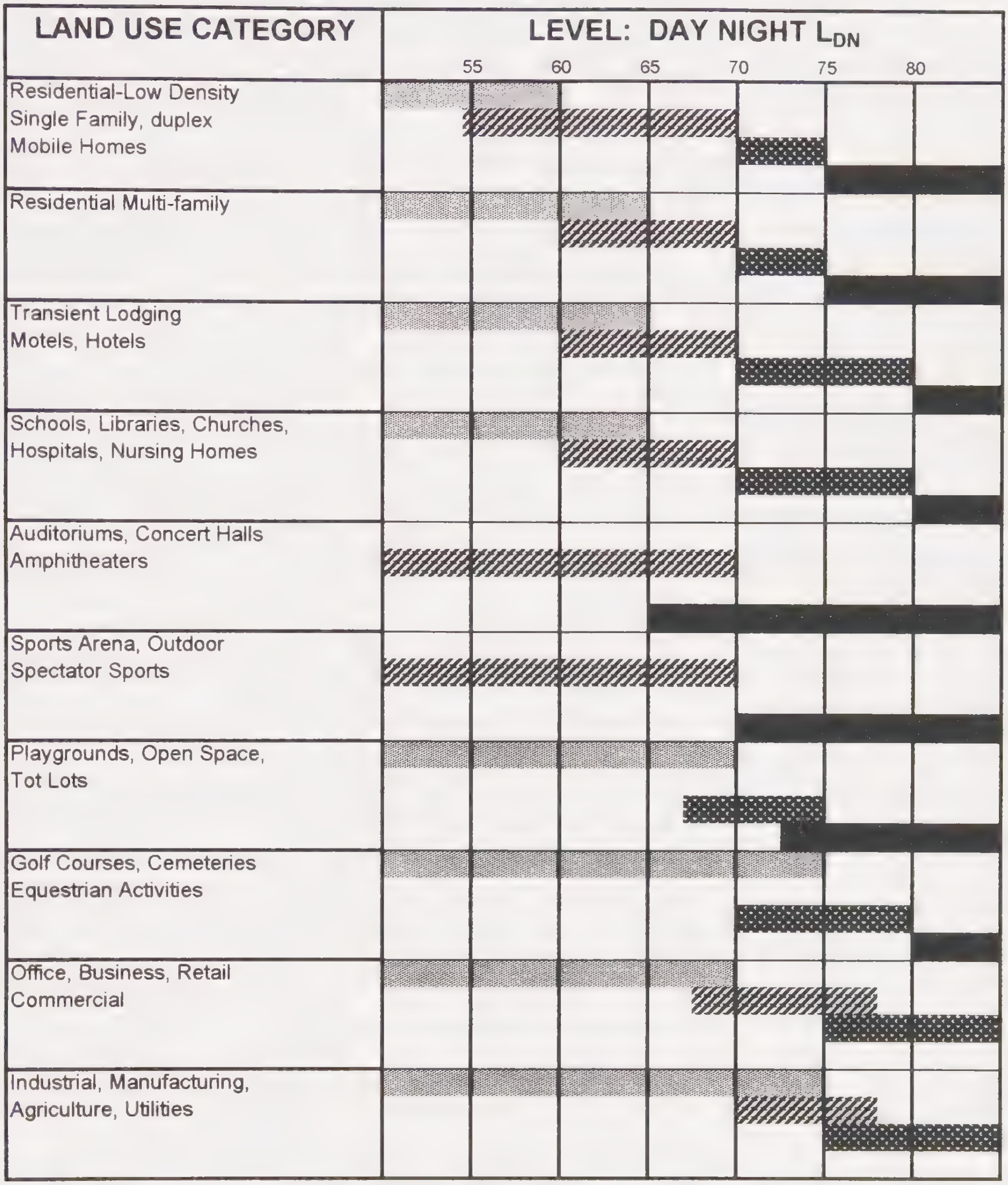
State Office of Noise Control

A noise element of a general plan is required by state law to recognize the guidelines for noise element preparation set forth by the State Office of Noise Control (Government Code Section 65302(f)). The extent to which a municipality recognizes and implements the guidelines is governed by case law and the applicability of the particular regulation as it relates to the uniqueness of the jurisdiction. The State Office of Noise Control is a branch within the State Department of Health Services. The Office of Noise Control works in coordination with the State Office of Planning and Research. The Guidelines, originally set forth in February 1976, have been revised since their inception, the latest revision being 1990. The Guidelines also set forth a methodological approach to drafting a noise element and include the Noise Compatibility Guidelines (see Figure 3) to guide land use decisions. The Noise Compatibility Guidelines are drafted in such a manner that allows a municipality to adopt them as the official criteria to guide future land use decisions. The Noise Compatibility Guidelines, as mentioned previously in this noise element were adopted by Belmont in 1976.

State Noise Insulation Standards

State noise insulation standards are required for multi-family development. The standards, contained in Title 24, California Administrative Code, Part 2, Chapter 2.35, are employed during construction. Insulation features result in reducing the ambient interior noise level of a multi-family dwelling to a level determined sufficient by the EPA to protect the occupants from hearing loss and other effects resulting from excessive noise exposure. Noise insulation standards are required for multi-family residential development because multi-family development is permitted in an exterior noise environment that is approximately five dBA higher than single-family, and because multi-family dwellings are usually subject to more noise impacts

Figure 3
Noise Compatibility Guidelines



NORMALLY ACCEPTABLE
Specified land use is satisfactory, based on the assumption that any buildings involved are of normal construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems will usually suffice.

NORMALLY UNACCEPTABLE
New construction should generally be discouraged. If new construction does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction should generally not be undertaken.

Source: State Department of Health Services-Office of Noise Control

from adjacent apartments than single-family development is to from an adjacent house. Employing such features as insulation of piping assemblies, electrical devices, recessed cabinets, bathtubs, soffits, heating, ventilating, and exhaust systems, floor and ceiling assemblies between separate dwelling units, and entrance doors from exterior corridors results in reducing noise impacts to multi-family units.

California Department of Transportation (CALTRANS)

The California Department of Transportation Division of Aeronautics drafts and adopts noise standards that regulate public-use airports in the State of California. The standards and regulations are contained in Title 21 of the California Administrative Code which is amended by the Department periodically.

CALTRANS administers specific noise related programs along freeway in addition to that section of CALTRANS that administers aircraft noise regulations. The noise programs apply to mitigation of noise impacts to preexisting schools and residential uses along certain freeways. "New Construction or Reconstruction," "Community Noise Abatement Programs," and "School Noise Abatement Program" are three noise abatement programs that CALTRANS funds and administers.

Local

City/County Association of Governments (C/CAG)

Each county that is affected by an airport in the State of California must establish an Airport Land Use Commission and draft an Airport Land Use Plan pursuant to the State Aeronautics Act as codified in the Public Utilities Code. San Mateo County is affected by three airports; San Francisco International, San Carlos and Half Moon Bay Airports, the latter two airports being general aviation. Public Utilities Code, Article 3.5, Section 21670.1.(a)) does provide that an existing body may serve as the authority to regulate airport matters and prepare the state mandated Airport Land Use Plan.

In 1991, C/CAG was designated by the County Board of Supervisors and the City Selection Committee (made up of the Mayors of the nineteen cities and towns in the county) to serve as the Airport Land Use Commission for San Mateo County. C/CAG, founded in 1990, replaced the role of the Regional Planning Commission (RPC) which was established in 1964, and was designated by the San Mateo County Board of Supervisors in 1970 to serve as the County Airport Land Use Commission (ALUC). The ALUC was formed as an advisory body to the RPC and is still in effect and currently serves as an advisory body on airport related matters to C/CAG. The RPC, however, was abolished by the Board of Supervisors in 1991.

Belmont is a member of C/CAG but does not have a representative on the ALUC. This is due primarily to the fact that Belmont is outside the impact contour of 55 dBA, CNEL for San Francisco International Airport. Noise contours for San Carlos Airport include a small portion of Belmont that lies west of U.S. 101 between the 55 and 60 dBA, CNEL. Although Belmont

is not directly affected by aircraft noise, it is important for City staff and officials to continue to be aware of San Francisco International Airport and San Carlos Airport operations and expansion plans in order to minimize noise impacts to Belmont residents.

San Mateo 1994 Comprehensive Airport Land Use Plan

The San Mateo County Comprehensive Airport Land Use Plan was adopted by C/CAG on December 8, 1994. The Plan addresses airport land/use compatibility issues related to proposed land use policy actions on a regional County-wide level. The effect of the Plan is not retroactive. Local planning approvals that occurred prior to the Plan adoption remain in effect and are not required to be brought in compliance with the new Plan. The Plan does not usurp local governmental authority; final approval of local land use policies and subsequent actions still remains with local governments. The authority of the Plan does require local governments to amend local general plans to bring said plans into compliance with the County-wide Plan, if inconsistencies exist. The responsibility for the compliance review is with the local government. No amendments to Belmont's General Plan were required in order to comply with the County Plan.

San Francisco International Airport Master Plan and Environmental Impact Report

A final draft Master Airport Plan was published by the Airports Commission in November 1989. A Master Plan Environmental Impact Report was certified by the San Francisco Planning Commission in May 1992. The Master Plan is a two-phase physical/management design plan for airport facilities and circulation systems. The Plan is a short (five year) and long-range (20 year) planning document for implementing changes in the use of airport-owned properties and facilities. One of the more significant changes to the airport is the construction of a new international terminal and the conversion of the existing international terminal into additional domestic terminals.

Belmont is in a unique situation, as is the rest of San Mateo County in terms of airport jurisdiction. San Francisco International Airport is located in San Mateo County but is regulated and governed by the Airports Commission of the City and County of San Francisco. The San Francisco International Airport periodically updates the Airport Master Plan; like other environmental documents and plans, affected cities, counties and the public are encouraged to comment.

Metropolitan Transportation Commission (MTC)

MTC was created by the State legislature in 1970 to prepare a regional transportation plan for the nine counties in the Bay Area. In addition to preparing this plan, MTC approves transportation projects that receive state or federal funding; allocates funds for transit operations; sets toll rates on bridges in the region (except the Golden Gate Bridge); evaluates the performance of the transportation system; and, promotes transit system coordination. As will become evident in the following discussion, MTC, San Mateo County Transportation Authority, the Peninsula Joint Powers Board, and SamTrans are stand-alone agencies; however, functionally there is an overlap of activities.

San Mateo County Transportation District (SamTrans)

SamTrans was formed by an act of the California State Legislature on August 14, 1974 and was approved by county voters in a general election in November of that year. Voters also approved a county-wide half-cent sales tax at that time to provide bus service within San Mateo County. The District became functional on January 1, 1975 and by July of that year consolidated 11 separate municipal systems to serve a 446 square-mile service area within 23 communities. In 1977, SamTrans inaugurated trunkline service between Palo Alto and downtown San Francisco, which is currently operated under contract by Grosvenor Bus Lines. The trunkline was followed by the introduction of Redi-Wheels, demand-responsive service for mobility-impaired patrons.

SamTrans is a special purpose district and is governed by a nine-member Board of Directors. The County Board of Supervisors selects two of its members and a public member, designated as a transportation expert, to serve on the SamTrans Board. The mayors of the cities throughout the County appoint three elected city officials from each of the County judicial districts. Three members of the general public, one representing the coastside, are then selected by the six directors to serve.

The Board meets once a month to determine overall policy for the District. Meetings are advertised and open to the public in compliance with the Brown Act. Directors serve on standing and ad hoc committees of the Board to review District matters and make recommendations to the full Board. The committees usually meet once a month and include: Finance, Legislative, Community Relations, and Planning and Development. Input to the Board also comes from a 15-member Citizens Advisory Committee (CAC) and a County-wide Paratransit Coordinating Council (PCC).

San Mateo County Transportation Authority

On June 7, 1988, San Mateo County voters passed a referendum to establish a 20-year, 0.5-cent retail transactions and use tax ("sales tax") to fund a list of essential transportation improvement projects in the County and the 20 cities in the County. The San Mateo County Transportation Authority (TA) was established to develop a County-wide Transportation Expenditure Plan (CTEP) and to implement the Plan. The CTEP identifies about 80 specific rail and roadway transportation improvement projects and specifies annual allocations of sale tax revenues for local street and road programs, transportation system management (TSM) programs, and bicycle programs. CalTrain improvements/grade separations and street/highway improvements are in the two top priority categories for funding.

The TA governing board meets once a month and is comprised of seven members, all of whom must be elected officials from throughout the County. The board includes four councilmembers appointed by the San Mateo City Selection Committee; two members from the County Board of Supervisors; and one member from the San Mateo County Transit District Board of Directors. The TA Board is assisted in its public process by the fifteen-member Citizen Advisory Committee.

Peninsula Corridor Joint Powers Board (JPB)

The JPB was founded in order to transfer the administrative responsibility for CalTrain from the State (Caltrans) to the local level. Therefore, in 1987, representatives from the City and County of San Francisco, the San Mateo County Transit Authority (SamTrans) and the Santa Clara County Transportation Agency (SCCTA) formally signed a Joint Powers Agreement. The agreement stipulates the membership and powers and financial commitments for the members; delegates SamTrans as the managing agency of CalTrain as well as detailing other administrative procedures. SamTrans provides administrative staff for CalTrain and oversight of the operating contract by the SamTrans Rail Division as well as staff member liaison to affiliated JPB agencies and the Staff Coordinating Council.

The JPB assumed an expanded role in scope in 1992 as CalTrain and SamTrans personnel coordinated the transfer of CalTrain operations and administration to the JPB. The JPB selected Amtrack as the new operator of CalTrain. In summary the three-county JPB collectively shapes the current and future direction of CalTrain service while SamTrans provides administrative support.

The JPB is comprised of nine members, three from each signatory county. JPB meets once a month and has the input of its own Citizen Advisory Committee and the staff Coordinating Council which is comprised of seven representatives from the three counties.

3 EXISTING NOISE ENVIRONMENT

Introduction

This section describes the existing noise environment in Belmont. The section first describes various noise sources and sensitive receptors in general, and in Belmont. A discussion of the noise monitoring and modeling program that was used to develop the existing and projected noise contours in Belmont closes the section.

Description of Noise Sources

Ambient Sources

Noise sources in Belmont include U.S. Route 101 and arterials such as State Highway 82, Alameda de las Pulgas, and Ralston Avenue and to a much lesser extent Interstate 280; and local major streets such as Old County Road (El Camino Real); CalTrain, the Peninsula commuter train; and to a lesser extent commercial uses along Old County Road; and, general aviation aircraft associated with San Carlos Airport. The level of noise along and nearby a freeway, arterial, or local street is a function of the traffic volume, the speed of the traffic, and the types of vehicles in the traffic stream (car, light or heavy truck). Heavier volumes of traffic produce more noise than lighter volumes of traffic. Slower or congested traffic traveling along a freeway produces more noise than traffic traveling at the posted freeway speed. Heavy trucks, tractor-trailers and diesel buses are noisier than standard passenger cars. Traffic volumes, however, must double over existing volumes for there to be a perceptible (three dBA) increase in noise levels. Traffic noise is usually much more pronounced during morning and evening peak commute hours.

CalTrain commuter operations contribute to the noise environment in Belmont to a much lesser level than traffic noise associated with U.S. 101. Train pass-bys are usually short in duration; seven seconds or less. Typically, it is the train whistle and not the pass-by that is the intrusive event. The Ralston Avenue and Harbor Boulevard grade separations will eliminate the need for the train whistle.

Commercial and industrial land uses are a source of noise. Commercial land uses generate vehicular and pedestrian traffic both of which add to the noise environment. Commercial use noise sources also include delivery and unloading activities and sometimes minor processing of goods. Commercial uses in Belmont are centered along El Camino Real (State Route 82); Alameda de las Pulgas, and Old County Road corridors. Commercial activities occur in shopping centers as well as strip commercial malls and pockets of industrial or heavy commercial sites along El Camino Real and Old County Road.

Industrial noise sources are usually more intrusive in nature than commercial noise sources. Delivery of raw and finished materials, usually in large tractor-trailers; use of heavy equipment

such as saws, grinders and other machinery; and speaker systems add to the noise environment. Industrial land uses are minimal in Belmont; are clustered along Old County Road and in pockets in the unincorporated County; and are of a less intense nature than typical industrial land uses.

Temporary Sources

The noise sources described above are fairly continuous noise sources. The noise levels the uses generate do vary over a 24-hour period, from business hours to evening hours, and they may cease on weekends, Sundays or holidays; their pattern, however is fairly continuous year round. Another type of noise worthy of mention is temporary noise generated from construction activities.

Construction noise is intrusive and can reach up to 150 decibels at 50 feet from the source for pile driving. Construction noise is shorter in duration than noise associated with fixed land uses. The time frame for heavy construction-related noise is regulated in Belmont through the environmental review process and Grading Ordinance. Typically, heavy construction activities such as pile driving and grading are limited to the daytime hours, 8:00 A.M. to 5:00 P.M. and prohibited on weekends and holidays. The time limitation protects residents near the construction activity from the higher noise levels during the noise sensitive times of the days, evening and nighttime, and noise sensitive times of the week, weekends when people are usually home.

Earthmoving equipment such as compactors, backhoes, tractors, trucks and graders range from 70 to 90 dBA at 50 feet from the source. Impact equipment such as pneumatic wrenches, jack hammers and pile drivers generate higher levels of noise. The noise range for this type of equipment is 80 to 105 dBA at 50 feet from the source. The types of equipment and the noise levels associated with the equipment is shown in Figure 4 "Construction Equipment Noise Levels".

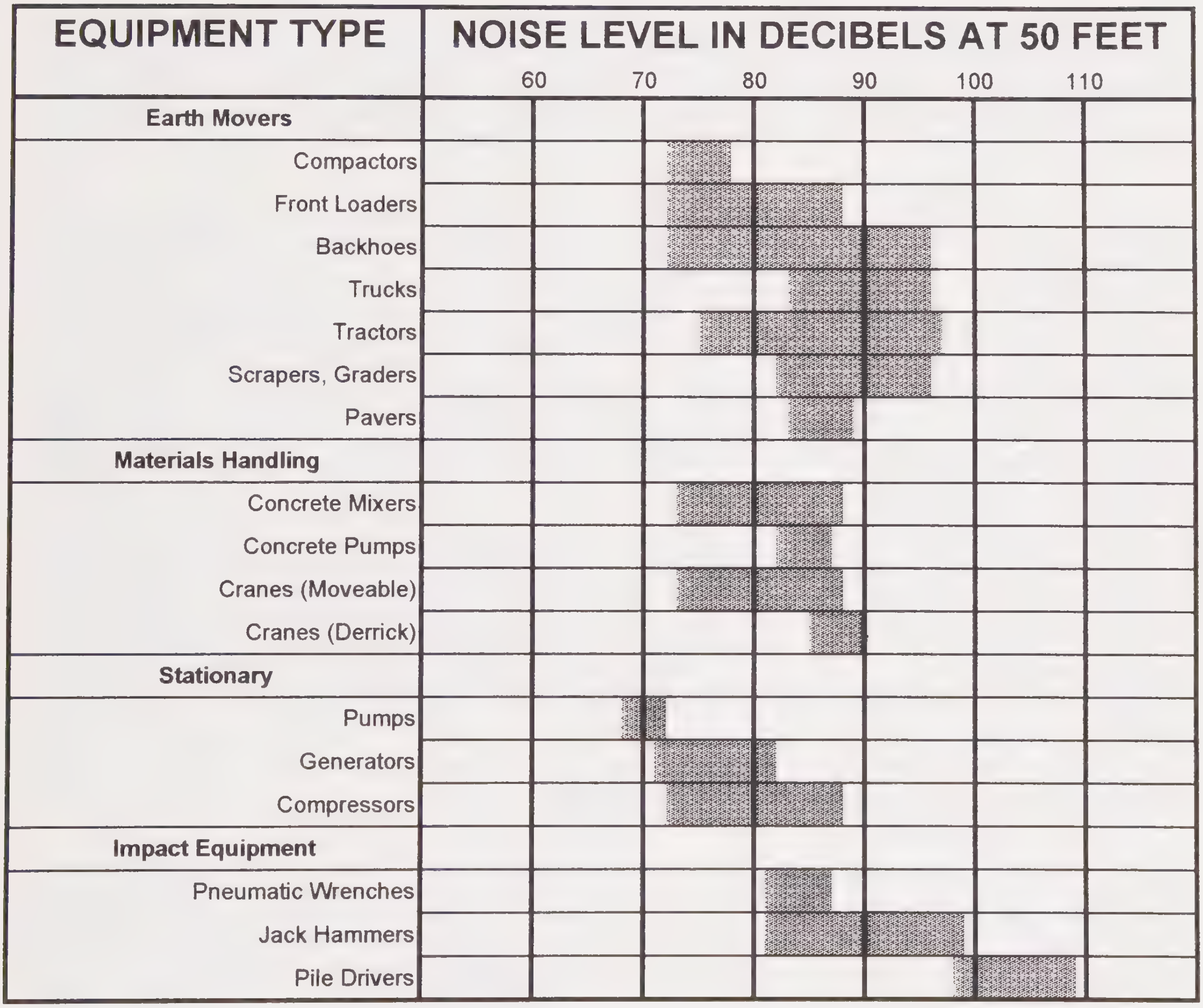
Description of Sensitive Receptors

Residential areas, hospitals and extended care facilitates, schools, libraries, and parks and open spaces are land uses that are considered more sensitive to high noise levels and changes in ambient noise levels. High noise levels and intrusive noise can disrupt relaxation and sleep, convalescing, and the enjoyment of open space and recreational areas.

Approximately 58 percent of Belmont is residential and of this, approximately 90 percent is low to medium density. Development is predominantly single-family, condominium, and townhome construction. The low-density residential land use category also includes residential care facilities such as Crestview Group Home, Belmont House, Hiller and North Group Homes.

Belmont Hills Hospital is the only hospital in Belmont. Belmont has 13 schools, one college and one library. Approximately 18 percent of Belmont is open space. Twenty percent of the open space is developed as community parks (five parks or 56 acres); neighborhood parks (11 parks or 43 acres); and minor parks (four parks or 1.1 acres). Public and private open space consists of approximately 400 acres and is located in the hillier portion of Belmont in the San Juan Hills

Figure 4
Construction Equipment Noise Levels



Source: Based on available data samples from various Environmental Impact Reports.

and Western Hills Areas and Water Dog Lake Park and is used primarily for preservation; geotechnical mitigation and hiking. Although there are different categories of open space, the expected use of the land is the same: relaxation and recreation. The general local of sensitive receptors in Belmont is shown on the 1992 General Plan Land Use Map.

Noise Monitoring, Modeling and Mapping Methology

State Planning Law (Government Code Section 65302) requires cities to prepare noise contours around major noise sources. The requirement is designed to identify areas of noise impact. Belmont retained the services of Environmental Science Associates, environmental consultants, to conduct a noise monitoring program. The program included five 24-hour noise measurements and eight short-term measurements. (See Figure 1, 'Noise Measurement Locations,' for the location of the noise measures). Noise contours were developed and mapped in five decibel bands using the day night noise (L_{dn}) metric.

California Department of Transportation's SOUND32 (California Department of Transportation, 1991) model was used to estimate p.m. peak-hour noise levels (L_{eq}) estimates, and the noise exposure maps were prepared using the assumption that the p.m. peak-hour noise level is equivalent to the 24-hour L_{dn} at a given location. This assumption is reasonably accurate in urban settings where traffic is the predominant source of noise.

Input to SOUND32 includes peak-hour traffic volumes (auto, medium truck and heavy truck volumes are entered separately), average vehicle speeds, barrier locations and heights (e.g. the soundwall along the west side of U.S. Route 101 parallel to Seagate Way) and user-specified attenuation rates.

Four barriers were included in the modeling effort, including the soundwall parallel to Seagate Way along U.S. Route 101, and three earthen barriers. Two of the earthen barriers form the support for the U.S. route 101/Marine Parkway Interchange. The third barrier is a topographic rise east of, and adjacent to, U.S. Route 101 north of Marine Parkway.

Attenuation rates are a critical variable for estimating noise levels. For the noise exposure maps, an attenuation rate of 4.5 dBA per doubling of distance (from the centerline of a roadway) was assumed. An attenuation rate of 4.5 dBA was chosen since it reflects a "soft site" which is appropriate for the flatter area east of El Camino Real, and it roughly accounts for topographic shielding in the hillier western portion of the City.

Results of Noise Monitoring: Existing Conditions

The Environmental Protection Agency established 70 dBA, L_{eq} as the noise level requisite to protect the public from the health effects of severe noise exposure year round. To assess noise impacts on existing developments, the EPA criterion is used; proposed development is compared to the State Noise Compatibility Guides. Belmont meets the 70 dBA, exposure level throughout the City in areas where there are sensitive receptors. Oxford Way (location C) is at the 70 dBA, L_{eq} threshold, as discussed below. Future development at the location should incorporate noise insulation and mitigation features. The following includes a brief description of the five 24-hour noise measurement locations and the results. (See Map 1, Existing Noise Contours.)

<u>Typical Residential Ambient Noise Levels</u>

Location A: Monserat Avenue

Overall, the vast majority of residents in Belmont experience an environment free of pervasive or intrusive noise. To document typical ambient noise levels in a residential neighborhood in Belmont, a 24-hour measurement was taken along Monserat Avenue on the grounds of Cipriani Elementary School. The noise environment is 56 dBA, L_{dn} and is within the acceptable range for residential development identified by the State Office of Noise Control - Noise Compatibility Guidelines.

Minor traffic is the predominant source of noise along Monserat Avenue as it is in most residential neighborhoods in Belmont. The Monserat Avenue noise measurements follow the typical residential noise pattern in which the highest hourly noise levels occur during the a.m. and p.m. commute hours. The peak-hour average noise level is approximately 61 dBA and typical maximum noise levels during the daytime are between 70 and 80 dBA. The day-night average noise level (L_{dn}) was measured to be 56 L_{dn}. Nighttime noise levels are typically lower than 40 dBA. Figure 5 contains the noise measurement data from Location A.

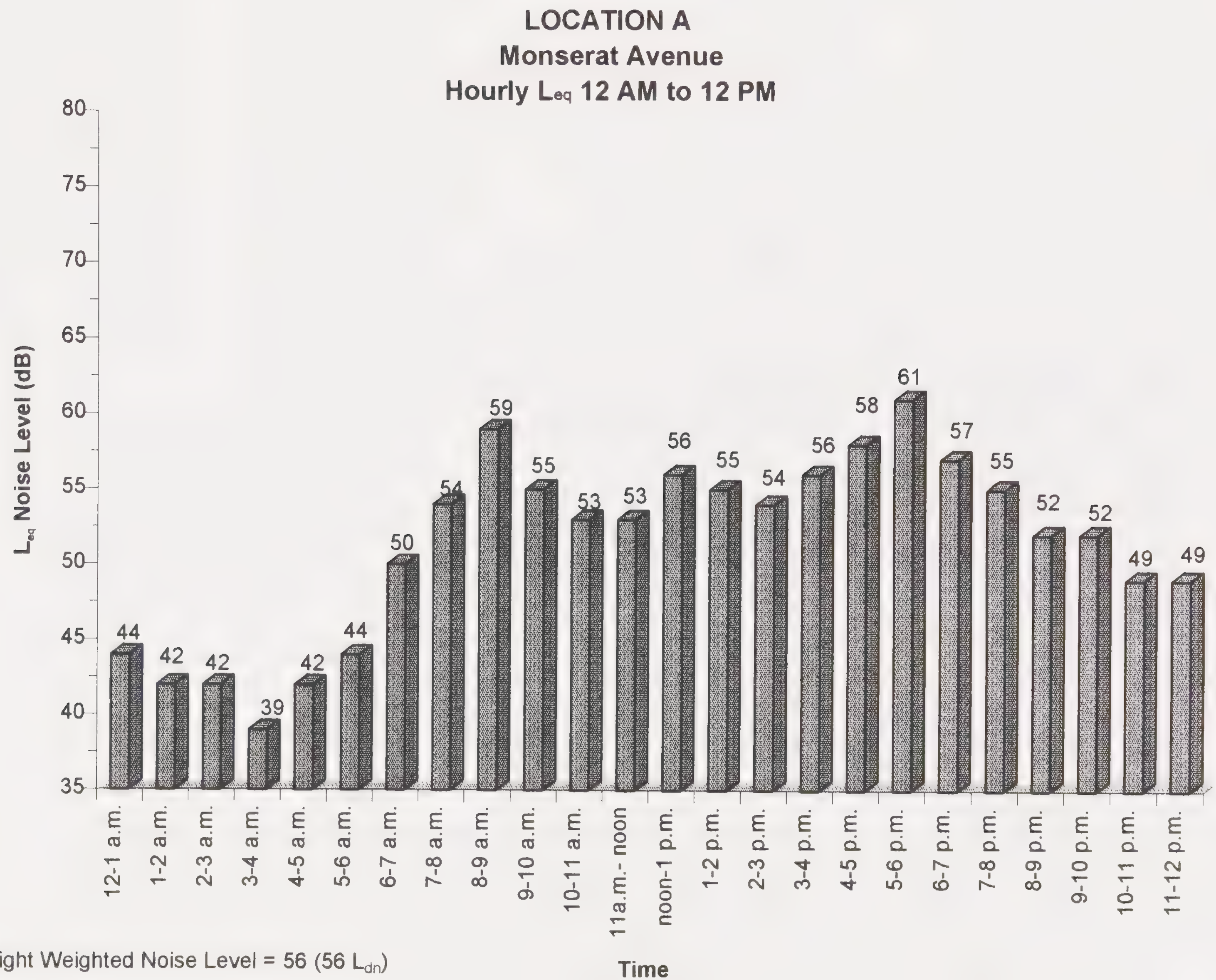
<u>Motor Vehicle Traffic Noise Effects</u>

Location B: Softball Fields East of U.S. 101
Location C: Oxford Way West of U.S. 101
Location D: Ralston Avenue at Continentals

Roadways in Belmont include a regional freeway (U.S. Route 101), arterials (El Camino Real, Ralston Avenue, Marine World Parkway, Alameda de las Pulgas, Old County Road), collectors and local streets. The *1994 Regional Transportation Plan for the San Francisco Bay Area* (Metropolitan Transportation Commission, 1994a) indicates that no major changes in the regional transportation network affecting Belmont are expected over the next 20 years. Nevertheless, traffic volumes on regional facilities such as U.S. Route 101 would continue to keep pace with regional growth and development.

On the local street network, modest increases in traffic volumes are expected given that few parcels in Belmont remain undeveloped and given current ABAG projections of population and

Figure 5



24-Hour Day-Night Weighted Noise Level = 56 (56 L_{dn})
82 dBA, L_{max}

Source: Environmental Science Associates
Tuesday, September 12 and Wednesday, September 13, 1995

employment in Belmont. The Association of Bay Area Governments (ABAG) predicts that population in Belmont will remain essentially unchanged between Years 1995 and 2015 (from 25,400 to 25,500) and that employment in Belmont will increase approximately 13% (from 11,500 to 13,950) over the same period (Association of Bay Area Governments, 1995).

Softball Fields East of U.S. 101

Among the roadways that affect noise levels in Belmont, the highest average noise levels are observed along the U.S. Route 101 (U.S. 101) corridor. U.S. 101 currently supports approximately 16,200 vehicles during the peak-hour (California Department of Transportation, 1994a). The vehicle mix is approximately 95% light-duty vehicles with the balance comprised in equal proportion by medium duty trucks (2.5%) and heavy duty trucks (2.5%) (California Department of Transportation, 1994b).

Two 24-hour measurements were taken in the vicinity of U.S. 101. Figure 6 contains noise measurement data from a location (Location B on Figure 1) on the east side of U.S. 101 at a distance of approximately 700 feet from the U.S. 101 median. The 24 hour L_{dn} in this location is 71. The most intrusive noise event during the 24-hour period was measured at 90 dBA. The 71 dBA, L_{dn} is at the threshold of normally acceptable and conditionally acceptable for an outdoor sports arena as identified by the State Office of Noise Control -- Noise Compatibility Guidelines. Despite the heavy traffic volume, noise impacts from U.S. 101 are lessened in Belmont by land use development policies that have resulted in development of less noise-sensitive uses east of U.S. 101. Recreational land uses (softball fields) have been developed east of U.S. 101; these less-sensitive uses buffer development further to the east along Concourse Drive and Clipper Drive.

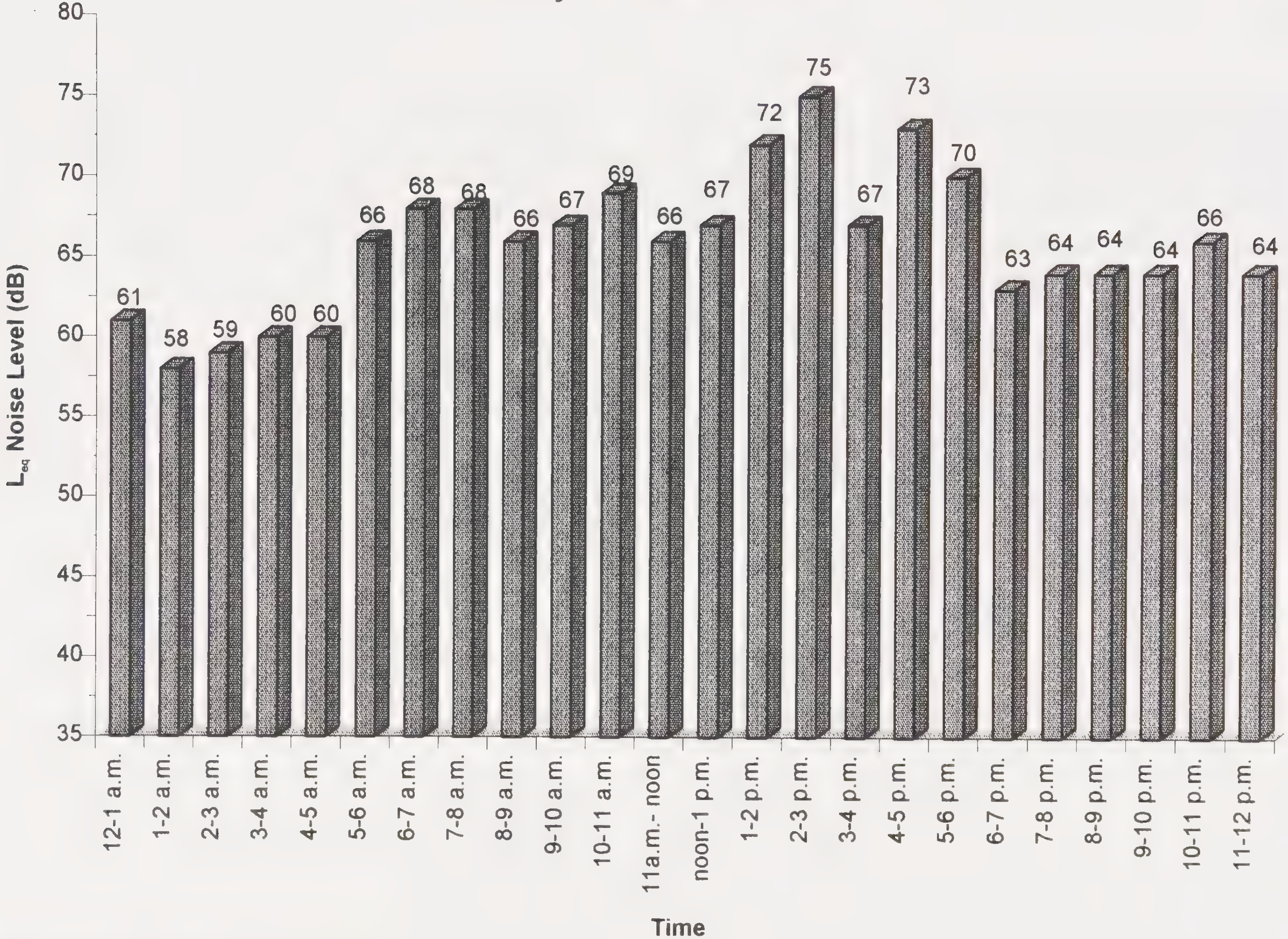
Oxford Way West of U.S. 101

Figure 7 contains noise measurement data from Oxford Way (Location C on Figure 1) on the west side of U.S. 101 at a distance of approximately 300 feet from the U.S. 101 median. The 24-hour L_{dn} at Oxford Way is 67 dBA, L_{eq} within the conditionally acceptable range for residential development as identified by the State Office of Noise Control - Noise Compatibility Guidelines. Conditionally acceptable requires additional noise mitigation features to be built into a project. The measurements made closer to the freeway recorded lower noise levels than the one farther away due to the shielding form intervening structures west of U.S. 101.

West of U.S. 101, a barrier extends from the northern City limit to the end of Seagate Way. Approximately six feet high, this barrier shields adjacent single-family residences from severe traffic noise. Beyond the end of the barrier, i.e., along Oxford Way and along the off-ramp from southbound U.S. 101 to Ralston Avenue, multi-family and single-family residences experience relatively high noise levels from traffic on U.S. 101. In contrast, residential uses west of U.S. 101 (south of Ralston Avenue) are set back from the edge of the highway approximately 300 feet and are shielded by less noise-sensitive uses that are located adjacent to the highway right-of-way.

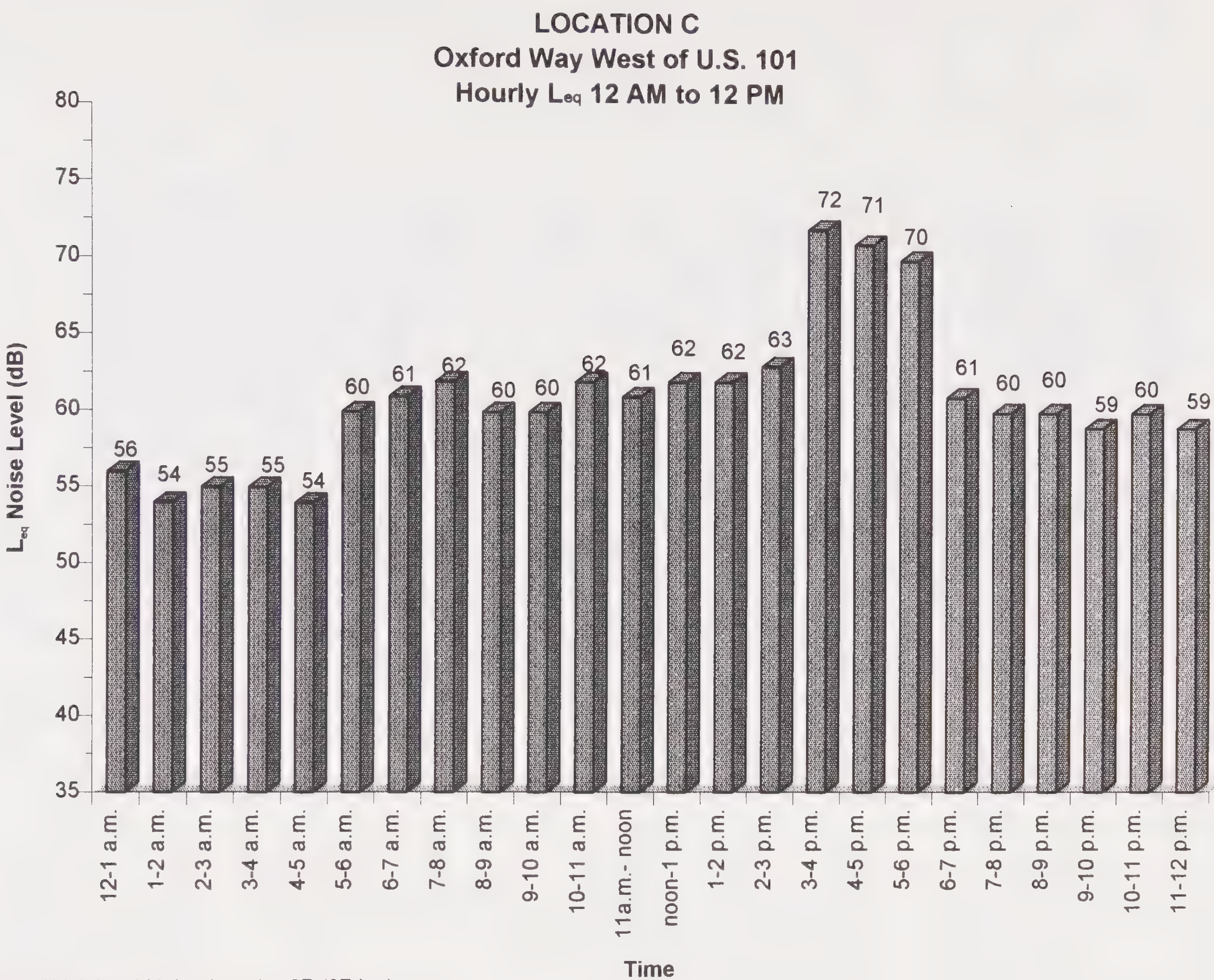
Figure 6

LOCATION B
East of U.S. 101 at Softball Fields
Hourly L_{eq} 12 AM to 12 PM



24-Hour Day-Night Weighted Noise Level = 71 (71 L_{dn})
90 dBA L_{max}
Source: Environmental Science Associates
Tuesday, August 15 and Wednesday, August 16, 1995

Figure 7



24-Hour Day-Night Weighted Noise Level = 67 (67 L_{dn})

Source: Environmental Science Associates
Tuesday August 15 and Wednesday August16, 1995

El Camino Real (State Route 82) is a major arterial that supports approximately 3,400 vehicles during the peak-hour (California Department of Transportation, 1994a). Most of the traffic on El Camino Real consists of light-duty vehicles (97%) with most of the balance (2.5%) comprised by medium trucks (heavy trucks are 0.5%)(California Department of Transportation, 1994b). Land uses along El Camino Real are almost entirely commercial.

Marine World Parkway is a major arterial that supports substantial amounts of traffic; however, it has little effect on Belmont since the only segment of this road that lies within the City limit is found at its interchange with U.S. 101. In the vicinity of this interchange, traffic noise is dominated by traffic on U.S. 101 rather than traffic on Marine World Parkway.

Location D: Ralston Avenue at Continentals Way

Ralston Avenue is a major arterial that supports approximately 2,600 vehicles during the peak hour (Public Affairs Management, 1990). This roadway extends through the entire City from east to west, and as such, affects noise levels in the hilly western portion of the city. The topographical features through which Ralston Avenue passes provide opportunities to reduce noise impacts associated with future development proposals without the need to construct noise walls. A 24-hour noise measurement was taken along Ralston Avenue in the vicinity of Continentals Way (Location D on Figure 1) and Figure 8 shows the data from this measurement. The 24-hour L_{dn} at this location is 67 and is within the conditionally acceptable range for residential development as identified by the State Office of Noise Control - Noise Compatibility Guidelines. Conditionally acceptable requires additional noise mitigation features to be built into a project.

The measurement data indicates that hourly average noise levels along Ralston Avenue reach 69 dBA during the peak-hour. Maximum noise levels are typically in the 75 to 85 dBA range. The measurement data taken at Location D is consistent with a noise measurement taken in 1992 for a development along Ralston Avenue. The 1992 measurement indicated peak-hour average noise levels at the Ralston Avenue right-of-way of approximately 68 dBA for the 1100 Ralston Avenue senior condominium project.

<u>Heavy Commercial Activity and Train Operation Noise</u>

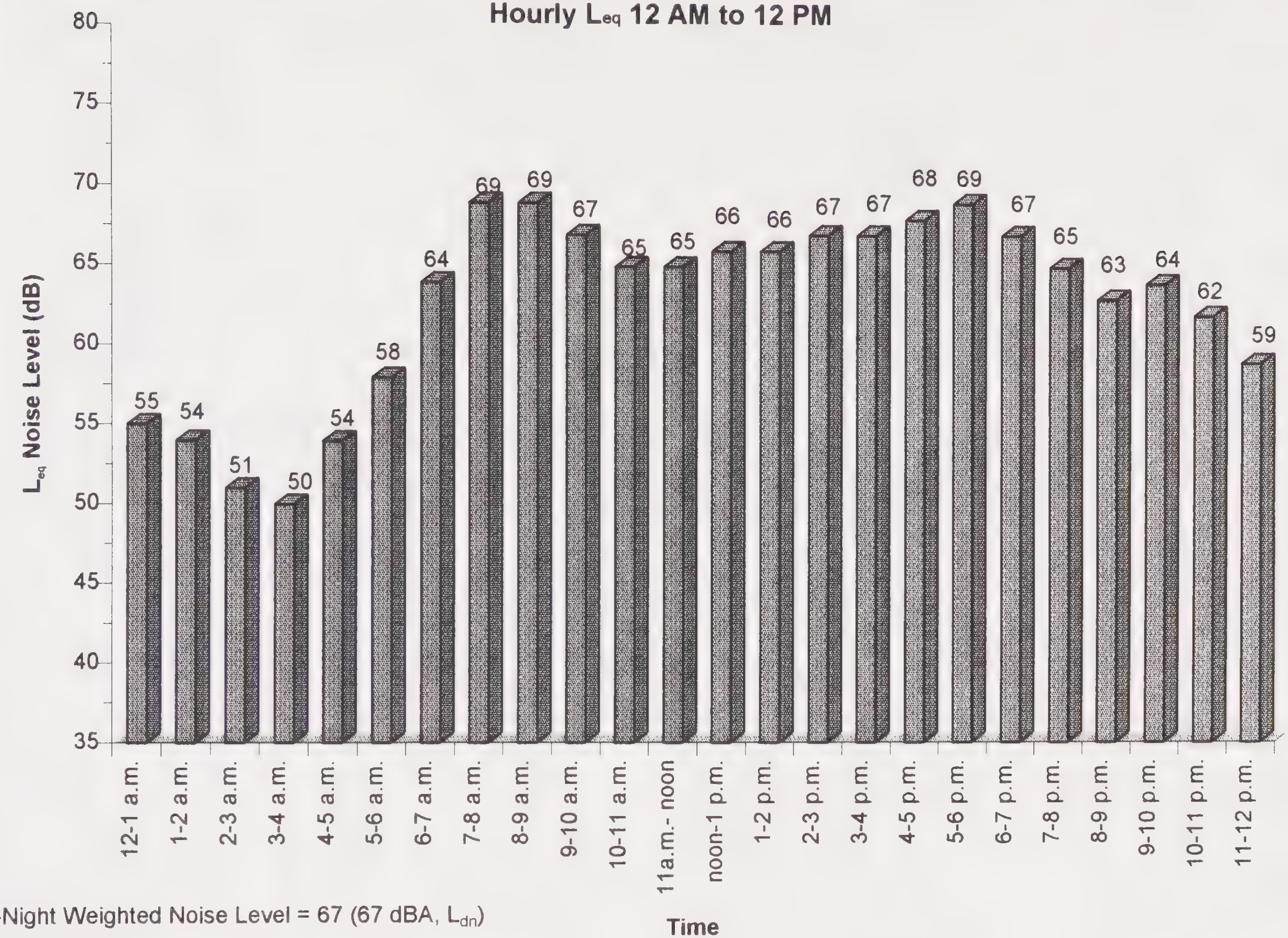
Location E: Old County Road

Alameda de las Pulgas and Old County Road also support substantial amounts of traffic although not to the same degree as El Camino Real or Ralston Avenue. Both Alameda de las Pulgas and Old County Road extend through, or border on, residential areas. Residential uses along Old County Road experience noise from commercial uses (mostly auto service and shops) located on the west side of Old County Road and from CalTrain operations in addition to traffic noise. Police records indicate that residents along Old County Road occasionally complain about noise associated with commercial activities located in that area. A 24-hour noise measurement was along Old County Road near Crestview Avenue (Location E on Figure 1).

The measurement data indicates that hourly average noise levels along Old County Road reach 69 dBA during the peak-hour while the corresponding L_{dn} is approximately 68 (see Figure 9).

Figure 8

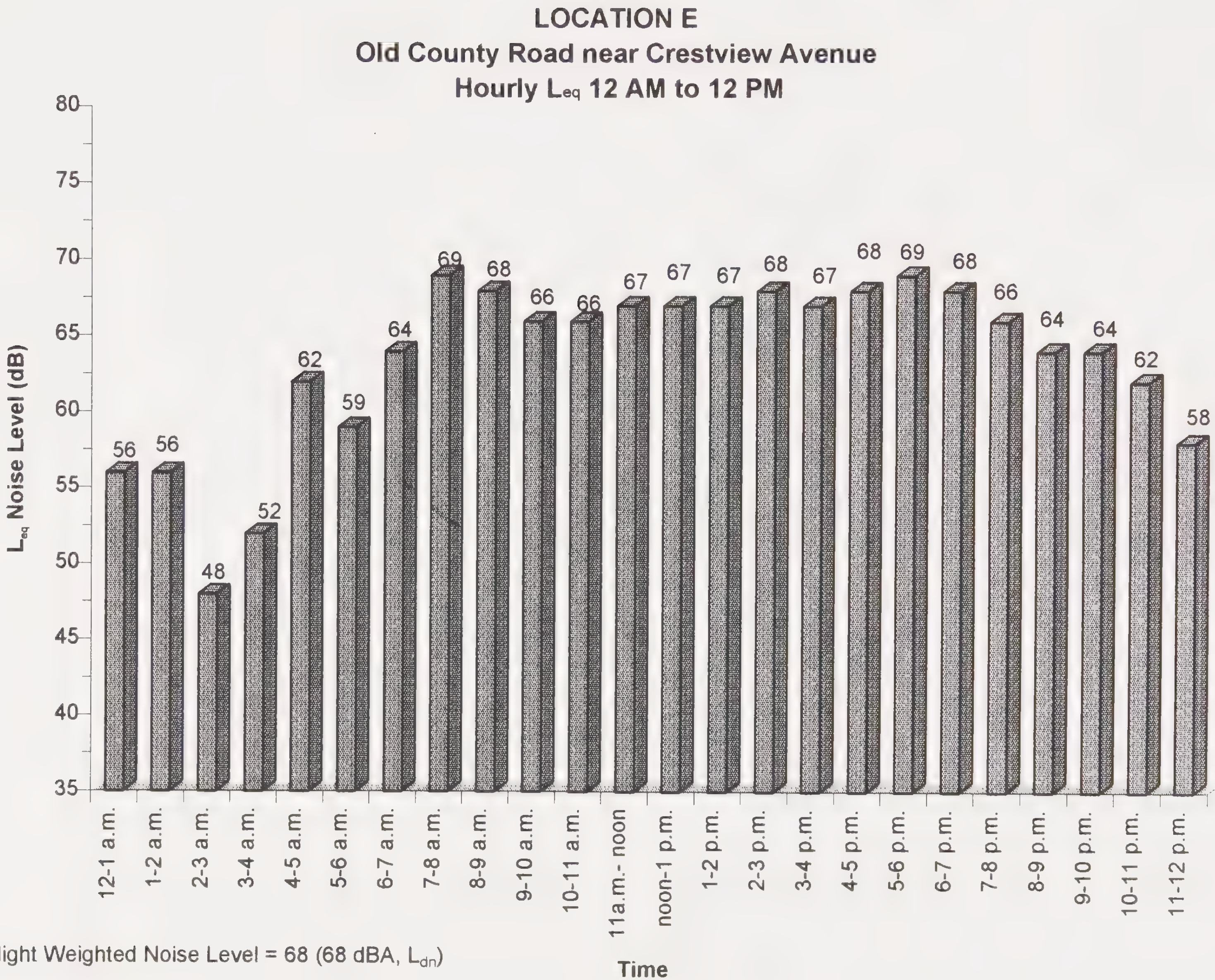
LOCATION D
Ralston Avenue at Continentals Way
Hourly L_{eq} 12 AM to 12 PM



24-Hour Day-Night Weighted Noise Level = 67 (67 dBA, L_{dn})
87 dBA, L_{max}

Source: Environmental Science Associates
Wednesday, October 4 and Thursday October 5, 1995

Figure 9



24-Hour Day-Night Weighted Noise Level = 68 (68 dBA, L_{dn})
96 dBA, L_{max}

Source: Environmental Science Associates
Monday, September 11 and Tuesday, September 12, 1995

The noise environment is within the acceptable range for commercial and industrial activities and conditionally acceptable for residential development as identified by the State Office of Noise Control - Noise Compatibility Guidelines. Additional noise mitigation features are required to be incorporated into residential development in the conditionally acceptable noise range. As a point of reference, additional noise mitigation features were incorporated into the newly constructed Horizons and Sterling Point residential developments, the only new residential developments along the Old County Road corridor in the past 10 years. Maximum noise levels are typically in the 75 to 90 dBA range. The predominate influence on noise at this location is traffic and commercial activities; although the train whistles do punctuate the noise environment.

Typical CalTrain Noise Levels

The railroad tracks that lie parallel to El Camino Real are used for the CalTrain Peninsula Commute Service (CalTrain) operated by the Peninsula Corridor Joint Powers Board. CalTrain operates a heavy-rail commuter line between Gilroy/San Jose and San Francisco. During weekdays, approximately 60 train pass-by events related to the CalTrain service occur along these tracks. Approximately 50 of these potentially-intrusive noise events occur during the daytime (7:00 A.M. to 10:00 P.M.) and approximately 10 occur during the nighttime (10:00 P.M. to 7:00 A.M.). Southern Pacific (SP) freight trains also use these tracks, primarily between the hours of 11:00 P.M. and 4:00 A.M. Typically, two freight-train passby events (one northbound and one southbound) occur each night as SP provides local service to industrial customers along the Peninsula.

The noise level from a CalTrain locomotive under full load is approximately 85 to 87 dBA at 100 feet (California Department of Transportation, 1988). Noise levels from the locomotives decrease by approximately six dBA with each doubling of distance from the track (Wyle Laboratories, 1973). The average duration of a train pass-by at any one point is approximately seven seconds (assuming an average speed of 50 miles per hour) and the L_{dn} at 50 feet from the tracks is approximately 67.

In Belmont, the only significant concentration of residential uses close to the CalTrain tracks are these located along Old County Road north of Ralston Avenue. Along this portion of Old County Road, the minimum distance between the tracks and the residential uses is approximately 120 feet. At 120 feet, CalTrain (and late-night freight) noise generates approximately 60 L_{dn} (an assumed attenuation rate of six dBA per doubling of distance). Figure 9 shows that noise levels along Old County Road (at approximately 120 feet from the tracks) are approximately 68 L_{dn} which strongly suggests that train noise is not the predominant source of noise in that area, but rather, that train noise contributes in a minor way to a noise environment that is largely influenced by traffic and commercial noise sources.

Scattered residential uses along El Camino Real are approximately 180 feet from the CalTrain tracks. Traffic noise along El Camino Real is greater than it is along Old County Road and predominates over train noise as the primary determinant of ambient noise conditions.

Aircraft Related Noise Levels

The City of Belmont lies adjacent to San Carlos Airport and within eight miles of San Francisco International Airport (SFIA). San Carlos Airport is a general-aviation, single-runway airport owned and operated by the County of San Mateo. It is located adjacent to the east side of U.S. 101 in the City of San Carlos. San Carlos Airport operates under an aircraft (maximum) weight limitation of 12,500 pounds. However, heavier aircraft may operate there with the approval of the County Airport Manager.

Aircraft operations[1] at San Carlos Airport typically range from 150,000 to 200,000 per year. A Master Plan is currently being developed for San Carlos Airport. Physical changes that would likely occur under this future Plan include a runway extension (to improve safety) and greater hangar space. The weight limitation (12,500 pounds) would remain in effect under the Master Plan.

The *Comprehensive Airport Land Use Plan* (City/County Association of Governments of San Mateo County, 1994) contains noise exposure contours[2] for Year 1995 for San Carlos Airport. These contours indicate that the area of Belmont that lies on the east side of U.S. 101 experiences noise levels in the range of 55 to 60 CNEL (annual average) from aircraft operations associated with San Carlos Airport. The CNEL, or Community Noise Equivalent Level, is a descriptor which is essentially the same as the L_{dn}. The portion of the City of Belmont that lies west of U.S. 101 experiences less than 55 CNEL from operations associated with San Carlos Airport.

Based on the noise exposure contours for Year 1995, the impact of San Carlos Airport on Belmont is minimal. The growth in general aviation aircraft operations at Bay Area airports could range from six percent to 37 percent over the next 20 years (Metropolitan Transportation Commission, 1994b). Such growth would result in an increase of less than one or two dBA in Airport-related noise assuming that flight tracks, types of aircraft, and diurnal activity patterns associated with San Carlos Airport remain essentially the same as under existing conditions.

One of the busiest commercial airports in the country, San Francisco International Airport (SFIA), lies approximately eight miles northweast of Belmont. The orientation of SFIA runways are such that Belmont experiences peripheral noise from late-night departures off Runways 10L and 10R (which typically depart in a southeasterly direction) and daytime arrivals onto Runways 28L and 28R (which typically arrive from a southeasterly direction). SFIA aircraft noise contours that were developed for the *SFIA Master Plan* only show noise levels down to 65 CNEL, but the geographic extent of the 65 CNEL contour developed for Year 1990 (City and

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[1]An aircraft operation is a landing or a takeoff. Thus, a landing-takeoff cycle includes two operations.

[2]Year 1995 noise exposure contours for San Carlos Airport reflect the following assumptions: 340,000 annual operations, no jets, a day/evening/night split of 95 to 5 to 1; a takeoff directions split of 60% to the northwest and 40% to the southeast. The original source of these contours is the *1981 Airport Land Use Plan*.

County of San Francisco, 1992) suggests that Belmont experiences no significant noise impact from SFIA operations (i.e. less than 55 CNEL). Noise exposure contours for SFIA developed for *SFIA Master Plan* forecasts for Year 2006 indicate the SFIA operations would continue to have no significant impact on the ambient noise environment in Belmont.

4 FUTURE NOISE ENVIRONMENT

Introduction

The following section describes the projected future noise environment in Belmont. The projected future year selected on which to base the noise contours is 2015. The projected year, 2015, provides a reasonable long-range prediction of the noise environment in Belmont and corresponds with the ABAG growth projections. Additionally, 20 years is typically the horizon for a long-range plan and it is reasonable to assume that technological advances that could affect the noise environment will follow similar patterns as those over the previous 15-20 years.

Future Noise Predictions

A comparison between the noise exposure map for existing conditions with the noise exposure map for future (year 2015) conditions shows that ambient noise levels are expected to increase by approximately one to three L_{dn} along the major roadways in the City. Since three-dBA is the threshold for noticeable change in an ambient noise environment, the ambient noise environment in the City would not be noticeably higher at most locations in the future. Increases of between two and three L_{dn} would occur along Old County Road which is expected to support twice as much traffic by 2015 as under existing conditions (see Map 2).

5 GOAL, POLICIES AND PROGRAMS

Introduction

This section of the Noise Element contains a discussion of the noise goal, policies and programs the City has adopted in order to promote a noise environment that is safe and includes a balance of the diverse and essential objectives of the City. The following goal, policies and programs are consistent with the other elements of Belmont's General Plan, Specific and Area Plans and the Redevelopment Plan.

Currently, the City regulates noise and maintains an environment relatively free of pervasive noise through a variety of ways. The Municipal Code regulates hours and days when grading is permitted which reduces construction related noise impacts in Belmont. The City, through discretionary review, regulates noise by implementing mitigation measures under the authority of the California Environmental Quality Act (CEQA) and through conditions of project approval by the authority of the California Government Code (Planning Code). Elected City officials serve on regional boards that affect transportation and subsequently noise, in Belmont. City staff affects the noise environment by reviewing and commenting on regional planning and environmental documents. These efforts have been successful in the past and should be continued in the future.

Goal: Promote a Balanced Community

Promote a noise environment that reflects a balance of the various City objectives while providing an environment that maintains a healthy living environment; fosters relaxation and recreation; is conducive to the work environment; and provides pleasant living conditions.

Policy 1.1: Use the noise contours (existing and proposed) to identify existing and potential noise impact areas in the City.

The noise contours provide a reliable data base for assessing noise impact areas. The contours should be used in conjunction with the State Office of Noise Control Guidelines (Noise Guidelines) to identify areas where land use incompatibilities exist and to guide development review and subsequent action. Additional noise study may be required and in some cases additional noise mitigation features may be required to be incorporated into project design. Noise mitigation measures can include additional insulation, double glazing of windows and increasing building setbacks from the noise source. Other more creative mitigations can include altering the pitch and style of a roof and altering the floor plan to reduce noise impacts to sensitive uses within a home, school, hospital or library. Water fountains can be used to mask roadway noise and solid wooden fences (with decorative landscaping) may be used as an alternative to sound walls.

Program 1.1 New Construction Noise Assessment

Action: Use the noise contours in conjunction with the Noise Guidelines to assess the suitability of a site for new construction.

Objective: Identification of appropriate sites for infill development that do not result in land use incompatibilities.

Responsible Department: Community Development.

Financing: None Required.

TimeFrame: 1996-Ongoing.

Program 1.2 New Construction Noise Mitigation

Action: Conduct additional study and identify and implement noise mitigation measures for new construction that is proposed in area within the contour range that is identified on the Noise Guidelines as "Conditionally Acceptable" or "Normally Unacceptable".

Objective: Mitigation of noise and land use incompatability.

Responsible Department: Community Development and Developer.

Financing: Developer.

TimeFrame: 1996-Ongoing.

Program 1.3 Review Intensification of Existing Land Uses

Action: Use the noise contours in conjunction with the Noise Guidelines to assess the appropriateness of intensification of existing land uses such as expansion of hours of operation; addition of floor area; or conversion of existing floor area into a more intensive use, where noise and land use incompatibilities exist.

Objective: Prevention or mitigation of the intensification of existing noise and land use incompatabilities.

Responsible Department: Community Development.

Financing: None Required.

TimeFrame: 1996-Ongoing.

Policy 2.1: ***Ensure that noise levels appropriate to protect the public health and well being are maintained.***

Belmont enjoys an environment relatively free of pervasive noise and is well within the thresholds set by the Evironmental Protection Agency (EPA) to maintain health and well being. Belmont's success in this area in spite of being flanked and intersectioned by U.S. 101, Interstate 280 and State Route 82 and CalTrain, is largely due to wise land use decisions; a pro-active stance on improving streets and roadways; and, levying mitigation measures and conditions of project approval in new development to reduce noise impacts. Decisions to place commercial buildings along the CalTrain and El Camino Real right-of-way is a decision which places less noise sensitive uses in a noise environment that is compatible with the use. The buildings themselves serve as a soundwall which shield the residential uses east of the right-of-way which are more sensitive to noise. Maintenance of public streets (such as the improvement and resurfacing of Ralston Avenue) also reduce noise and impacts associated with vehicular traffic. The grade separation projects will reduce train related noise impacts. Limiting hours of construction and grading activities reduces temporary noise impacts during evening hours and weekends.

Program 2.1 Serve on regional transportation committees and review regional transportation and development documents.

Action: Belmont elected officials should continue to serve on regional committees (C/CAG, SamTrans) that affect regional transportation modes. City officials and staff should continue to review and comment on county-wide airport land use plans, and the SamTrans and JPB plan for rail and bus service and State of California Department of Transportation (Caltrans) documents for state roadway improvements. Staff should continue to comment on environmental documents for development proposals that are outside of Belmont which have the potential to affect traffic and noise in Belmont.

Objective: Promote regional cooperation in noise reduction.

Responsible Department: City Council, Planning Commission, and City Staff.

Financing: None required.

TimeFrame: 1996-Ongoing.

Program 2.2 Improve and maintain surface streets.

Action: Repair and maintain City streets in order that vehicle speeds do not have to be continually adjusted (braking and accelerating) which adds to roadway noise.

Objective: Reduction in noise impacts associated with vehicular traffic on surface streets.

Responsible Department: Public Works.

Financing: Gas Tax Measure A funds.

TimeFrame: 1996-Ongoing.

Program 2.3 Improve Railroad and Grade Crossings

Action: Develop and implement a plan to separate the CalTrain railroad crossing for Harbor Boulevard and complete the grade separation at Ralston Avenue.

Objective: Reduction of intrusive noise associated with train whistles.

Responsible Department: Public Works.

Financing: Belmont Redevelopment Agency, California Department of Transportation and San Mateo County Transportation Authority.

TimeFrame: 1996 - 1998.

Program 2.4 Amend Belmont Municipal Code and Enforce the Municipal Code Amendments

Action: Amend the Belmont Municipal Code Chapter 2, Section 2-145, Chapter 15 Article 6 and Chapter 9 (Grading) to limit construction hours and require noise mitigation of construction equipment adjacent to noise sensitive areas. Examples of noise mitigations include the use of temporary power poles as opposed to generators; locating noise producing equipment the furthest distance possible from sensitive receptors; and, muffling the equipment when feasible. These amendments would address construction activities that are predominently administrative.

Responsible Departments: Community Development, Public Works and Police.

Financing: None Required.

TimeFrame: 1996 - 1997.

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Appendix A
Technical Glossary

A-Weighted Sound Level (dBA) is the sound pressure in decibels as measured on a sound meter using the A-filtering network. The A-filtering network de-emphasizes the very low and very high components of sound in a manner similar to the response of the human ear. The acronym dBA accompanies a given measurement or calculation and indicates a particular noise level measured with an A-filtering device.

Absorption reduces (attenuates) noise. Some portions of sound energy that strike a surface are converted to heat (thermal) energy rather than being reflected as noise; this reduces the amount of energy that is heard as noise. Absorptive materials include thick glass, spun fiberglass and materials such as upholstered furniture (as opposed to wood furniture), drapes and carpeting.

Airborne sound is sound that reaches the point of interest by travelling through air.

Ambient Noise Level constitutes the "normal" or "background" noise components and level of noise at a given location. Ambient noise is a composite from all noise sources that are experienced in a given location. Ambient noise in a residential area, for example, could consist of sounds of people talking, dogs barking, children playing and cars passing by. Ambient noise in an office might consist of people talking, telephones ringing, and sound of typewriter or computer keyboards clicking. Ambient noise in a cabinet shop could include saws, grinders, drills, sanders and people shouting.

Attenuation refers to the lessening or reduction of a noise level. Noise attenuates by travelling a distance from the source or by other mechanisms such as **absorption** or **reflection**. The placement of buildings, sound walls, and noise insulation features are predicated on noise attenuation. Noise will attenuate at different levels if the noise source originates from a **point** or **line** source and if it travels over a **hard** or **soft** surface and if it is **absorbed** or **reflected** by a noise mitigation feature. Basically five things are taken into consideration when calculating noise attenuation: the type of noise; level of noise at the source; distance the noise travels to the point of interest; type of terrain over which the noise travels; and the presence or absence of noise barriers.

Building Envelope is a technical term which refers to the components of a building such as the foundation, walls, windows and insulation and is an important concept in noise **attenuation**. Portions of the building envelope will reflect noise, some portions will absorb noise and some noise will be transmitted through to the interior of the building.

Community Noise Equivalent Level (CNEL) is the average equivalent A-filtered sound level during a 24-hour period. The value is obtained after the addition of 5 **decibels** to sound levels in the evening from 7:00 P.M. to 10:00 P.M. and after the addition of 10 decibels in the night after 10:00 P.M. and 7:00 A.M. The CNEL weights the actual noise measurements taken to

account for the increased sensitivity people have to noise during the evening and nighttime hours.

Cycles per second is a measure of frequency numerically equivalent to **hertz.**

Decibel is a logarithmic unit of sound intensity. Sound waves travel out from source and exert a force known as sound pressure. The sound pressure level of intensity is measured in decibels and is usually referred to as the sound level.

Doubling Distance refers to the doubling of a given distance (in feet) from a particular noise source. Doubling distance is used to calculate the amount noise will attenuate (reduce) from the noise source to the noise received.

Day Night Average Noise Level (Ldn) is the average equivalent A-filtered sound level during a 24-hour period obtained after the addition of 10 **decibels** to sound levels in the night after 10:00 P.M. and before 7:00 A.M. The Ldn weights noise measurements taken to account for the increased sensitivity people have to noise during the nighttime hours.

Energy Equivalent Noise Level (Leq) is the sound level corresponding to a steady state sound level containing the same total energy over a given period of time.

Environmental noise is a combination of noise from various sources which produce a relatively steady or **ambient** noise level. Environmental noise is a term often used to describe outdoor ambient noise that is experienced in our daily environment.

Frequency is the number of times per second that the sine-wave of sound repeats itself, or that the vibrating object repeats itself. Frequency is expressed in **hertz (Hz)** and was formally expressed in **cycles per second**.

Hard surfaces (terrain) including paved surfaces and concrete buildings. Hard surfaces reflect noise and tend to **absorb** less noise than do **soft surfaces** and thus, in the absence of other noise mitigation features, tend to **attenuate** noise less than soft surfaces. The importance of hard or soft surfaces comes into play in absence of other noise attenuation features and are most important when calculating noise attenuation due to distance from the noise source.

Hertz (Hz) is the unit of measurement of frequency numerically equal to **cycles per second.**

Intrusive noise is a noise that intrudes over the existing **ambient** noise in a given location. The relative intrusiveness of the sound depends upon the amplitude, duration, frequency and time of occurrence of the intrusive noise as well as the level of the ambient noise.

Line of site is often used when describing the noise source and noise receiver relationship. Basically, if one can see the noise source then one can hear the noise; if however, the line of sight is broken by a wall, building, mountain, or other barrier, then the noise source is reduced accordingly.

Lmax is the highest noise (sound pressure) level recorded during the measurement period. The Lmax represents one most intrusive noise event, there may be others of less intensity, during the measurement period. Intrusive noise can typically be from such sources as an aircraft flyover, a horn or siren, or construction activities.

Line source is a noise originated from a line such as a stream of moving traffic, a moving train, conveyor belt, or a river. Noise from a line source produces parallel sound waves moving linearly outward from the source. Noise will **attenuate** 3 dBA per doubling of distance from a line source in **hard terrain** and approximately 4.5 dBA per doubling of distance in **soft terrain**. The significance in the distinction between a line and point surface is the rate of attenuation.

Noise is a sound that is undesirable because it interferes with speech or hearing, or has the intensity or duration of such to damage hearing, or, is otherwise annoying.

Noise Compatibility Guidelines, developed by the State Office of Noise Control, establish certain criteria for noise levels with regard to land use compatibility. Each category of land use enjoys a range of noise levels considered compatible with the use and the noise levels may increase provided certain noise insulation features are employed.

Noise exposure contours are lines drawn about a noise source which indicate a constant level of noise exposure. Noise contours are similar to contours drawn on a topographical map which represent areas of the same elevation. Noise contours are significant inasmuch as they indicate areas where noise mitigation measures may be needed and they indicate what types of land uses are subject to particular noise exposures.

Point source noise originates from a single source such as a horn, motor and machinery. Point source noise produces spherical waves which travel outward in a circular pattern from the source. Point source noise **attenuates** approximately 6 dBA per doubling of distance from the source in **hard terrain** and approximately 9 dBA per doubling of distance in **soft terrain.** The significance in the distinction between a **line** and a point source is the rate of attenuation.

Reflection is a method that can reduce noise. Noise strikes a hard surface and is reflected back toward the source of the noise. Reflection can reduce noise in one area while adding noise in another area.

Sensitive receptor includes people engaging in activities that are sensitive to noise. Residential areas, hospitals, extended care facilities, schools, libraries and open spaces are land uses sensitive to noise.

Soft surfaces (terrain) includes surfaces such as barren earth, soil, landscaped areas, and acoustically absorptive materials. Soft surfaces absorb more sound energy than **hard surfaces** and thus more noise is attenuated in a soft environment. The importance of hard or soft surfaces comes into play in absence of other noise attenuation features and are most important when calculating noise attenuation due to distance; the further one is from the noise source the lesser the noise level (sound energy) at that location.